

AD-A096 588 WESTCLOX MILITARY PRODUCTS LA SALLE IL F/6 19/1
PROVE OUT OF AUTOMATED ASSEMBLY LINE FOR M564 DELAY ARMING MECH--ETC(U)
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DAAK10-79-C-0239

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FINAL REPORT

(ITEM A005 OF DD FORM 1423)

CONTRACT DAAK10-79-C-0239

PROVE OUT OF AUTOMATED ASSEMBLY LINE

FOR

M564 DELAY ARMING MECHANISMS

BY

ACQUISITION OF 40,000 UNITS

ASSEMBLED BY AUTOMATED LINE

AD A 096588

PREPARED

BY

WESTCLOX MILITARY PRODUCTS

LA SALLE, ILLINOIS 61301

SUBMITTED

JANUARY 22, 1981

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I N D E X

	Page
I Introduction	1
Exhibit A	2A
Exhibit B	2D
II General.....	3
III Work Performed/Machine Status.....	4
Machine #1 - Spacer, Pin and Plate Assembly	4
Machine #2 - Pallet Assembly.....	5
Machine #4 - Escape Wheel and Pinion Assembly	6
Machine #6 - #1 Gear and Pinion Assembly.....	7
Machine #9 - Rotor Ream	8
Machine #10 - Movement Module Assembly.....	8
Machine #11 - Body and Module Assembly.....	9
Machine #12 - Spin Test Line.....	9
Machine #13 - Setback Mechanism Assembly.....	10
Machine #14 - Setback Assembly Test	10
Machine #15 - 3000 RPM Test	11
IV Summary.....	12
V Conclusion	13
VI Recommendation	13
Attachment A.....	14
Attachment B.....	15
Attachment C.....	16
Attachment D.....	17
Appendix A.....	18
Appendix B.....	19
Appendix C.....	20
Appendix D.....	21

CONTRACT DAAK10-79-C-0239

I Introduction

A. History of the Automated Assembly Line

- (i) Approximately the first half of the Automated Assembly Line was generated under Frankford Arsenal Contract DAAA25-69-C-0301 dated 3-10-69 for "Services to design and develop an automated line for assembly of Safety Adapter, Fuze, M564", with additional work added by Modification P001, and final completion date being 5-15-74.
- (ii) The remaining second half of the Automated Assembly Line was accomplished under Frankford Arsenal Contract DAAA25-73-C-0715 dated 8-15-73 for Item 0001 ---complete the automation, debugging and application of automatic assembly machines for the M125A1 Booster---. Modification P0006 added Item 0003 ---provide additional capability to assemble and test M564/M565 Safety and Arming Devices on the M125A1 Booster automated assembly line. Additional work was required per Modification P00012 and final contract completion date was 12-31-77.
- (iii) The present contract, DAAK10-79-C-0239, dated 8-29-79, was generated by the Government's desire to have this automated line used on a production basis, and this contract required, Item 0001 "Contractor will fabricate 40,000 M564 Delay Arming Mechanisms and prove out automated line"---with completion date of February 1980.

- a. Post Award Conference held on November 7, 8 & 9, 1979 with Government and Westclox personnel in attendance. See Exhibit A for report on conference per DD Form 1901 dated 11-15-79.
 - b. As noted in above report Exhibit A, page 2, paragraph 2.b, "A delivery schedule extension request - based on the recent strike - is a distinct possibility", the three-month strike did have an effect on the delivery as shown in the contract.
 - c. The Quality Assurance Post Award Conference was held at Westclox on August 13 & 14, 1980, during which clarification and guidance regarding Quality Assurance items was furnished by Government personnel in attendance.
- (iv) Production objective per attached Exhibit B, Scope of Work, was to accomplish prove-out of the automated assembly line for the M125A1 Booster/M564, M565 Delay Arming Mechanism by fabricating, then assembling 40,000 M564 Delay Arming Mechanisms on the line. Further, determine the line will function at the design rate of 5,000 acceptable assemblies per day and collect production data for incorporation into final report.
- a. Description of machines is shown on Exhibit B.
 - b. Work performed during period of performance under Contract DAAK10-79-C-0239 is shown, by machine, under Section III - Work Performed/Machine Status.
 - c. Sequence of Operations for each machine is shown on Exhibit B.

PLANT VISIT REQUEST/REPORT		"X" APPLICABLE BOX <input type="checkbox"/> REQUEST <input checked="" type="checkbox"/> REPORT		DATE PREPARED 15 November 1979	
INSTRUCTIONS: The government representative normally will prepare the form in duplicate and forward the original, if applicable, to the appropriate department and retain the copy for his file. Additional essential copies or the original may be prepared for other departments as applicable. If the form is used as a request to another department to obtain data, "request" block will be checked, "topic/problem" block and also code block will be filled in by the requestor.					
FROM: (Code) DCRI-GCCA-AJ	TO: File	VIA (Code & Initials) DCRI-GCCA	VIA (Code & Initials)	VIA (Code & Initials)	VIA (Code & Initials)
CONTRACT NUMBER DAAK01-79-C-0239	PURCHASE ORDER NUMBER	PERSON(S) CONTACTED		TELEPHONE NUMBER	DATE OF VISIT OR TELEPHONE CALL
CONTRACTOR OR FACILITY AND ADDRESS (Include Zip Code) Westclox LaSalle, Illinois 61301		*See attached list of attendees.		815/224-5400	11/7/79, 11/8/79
TOPIC/PROBLEM (Continue on reverse side if necessary) Post-award conference on contract DAAK10-79-C-0239. This contract calls for the manufacture of 40,000 Delay Arming Mechanisms (DAMs) and to prove out the automated line. The DAM has a Project Manager assigned; as such, Mr. Frank Ruhmann expressed a willingness to chair the meeting, excluding that part of the conference that would deal with the administrative portion.					
ACTION TAKEN (Continue on reverse side if necessary) Inasmuch as the contractor has many years of experience in Government contracting, there was no need to dwell on the routine aspects of the portion of DD form 1484 dealing with contract administration. However, a number of points were discussed as being candidates for clarification and/or contract modification. The following items will be brought to the attention of the PCO and recommended for action. (see attached)					
RECOMMENDATIONS (Continue on reverse side if necessary) It is understood that minutes of the post-award conference pertaining to the Quality and technical aspects will be distributed by a member of the MERADCOM contingent.					
DISTRIBUTION: ✓ All Attendees			RECEIVED NOV 29 1979 WESTCLOX Contract Administration LaSalle, Ill. 61301		
FOLLOW-UP VISIT OR CALL REQUESTED BY			DATE VISIT OR CALL COMPLETED 8 November 1979		
REVIEWED BY (Supervisor) W. HYMAN, Branch Chief "A"			SIGNATURE E. R. Blozis E. R. BLOZIS, Contract Administrator		DATE 11/11/79

ACTION TAKEN (Continued)

1. The following areas may require contract modification:

- a. The contract should be modified to show that invoices will be submitted for payment through the local DCAA Branch
- b. Recommendation is made for Appendix B and Appendix A cited under Section J.8 (page 2 of 5) be supplied and made part of the contract. Also under J.8, the fourth line should be corrected to list DAAA09-79-C-0041 in lieu of DAAA09-72-C-0066.
- c. In DD form 1423, Sequence A006 should be corrected to agree with Section F.2.1 (page 30): delete MIL-Q-9858A and replace with MIL-I-45208A.
- d. Consideration should be given to the possibility of modifying the contract to add another line item. As it now stands, it is not clear that the contractor will deliver 40,000 DAMs to the Government.

2. Points of clarification:

- a. Westclox will submit with each voucher of its costs, a fee voucher in an amount bearing the same percentage of the fee as the cost voucher bears to the total estimated cost of the contract.
- b. A delivery schedule extension request -- based on the recent strike -- is a distinct possibility.
- c. Paragraph 16 of EXHIBIT C which is part of the contractor's letter SER No. 79-100 and included as part of the contract: labor costs might develop. It is not clear as to who would pay for the labor.
- d. Demilitarization; where applicable, disposition of completed or partially completed parts, components, subassemblies and end items will occur in accordance with normal disposition procedures and in compliance with DEMILITARIZATION CLAUSE I.4 (page 54) and paragraph 6 of Westclox letter SER 79-100 which is part of the contract.
- e. As a supplement to Part B under Section F.2.1 (page 30) Westclox has agreed to compile and maintain a list of equipment necessary for the performance of all inspections and tests required on this contract.
- f. A lot numbering system per MIL-STD-1168A will be used for record purposes. Lot number will not be physically applied to the production units.

LIST OF ATTENDEES

CONTRACT NO. DAAK10-79-C-0239

ITEM: Prove-out of Automated Assembly Line for M364 DAM Assembly

MEETING

DATE: 11/8/79

PLACE: WESTCLOX, A Talley Industries Company, La Salle, Ill. 61301

PURPOSE: Post Award Conference

ATTENDEES:

NAME	TITLE	ORGANIZATION	OFFICE SYMBOL	PHONE NO.
Maxwell Walker	Contr Specialist	ARRCO M	DRSHR-PDA-F	794-3970
C.J. Walenstein	Contr. Qual Mgr.	ARRCO M	DRSHR-PDA-S	794-4021
E.C. Kitchin	Mfg Eng	ARRCO M		224-5266
Tom Ellis	Industrial Specialist	ARRCO M	DRSHR-PDA-S	930-6186
E.R. Blozis	Contract Administrator	ARRCO M	DRSHR-PDA-S	930-2990
Frank H. Ruhmann	General Engineer	ARRCO M	DRSHR-PDA-S	880-8082
Paul Martin	Mechanical Eng	ARRCO M	DRSHR-PDA-S	880-6447
Lee Harrison	General Eng	ARRCO M	DRSHR-PDA-S	880-4386
B.P. Haden	SQAR	ARRCO M	DRSHR-PDA-S	880-5457
R. Ristan	MFG MGR	ARRCO M	DRSHR-PDA-S	224-5271
M. R. Foster	Contr Admin Mgr	ARRCO M	DRSHR-PDA-S	815-224-5401
M. J. West	MFG Eng	ARRCO M	DRSHR-PDA-S	815-224-5401
C. J. Pellicani	Q.A. MGR	ARRCO M	DRSHR-PDA-S	815-224-5401

CONTINUATION SHEET

PART II--SECTION F--DESCRIPTION/
SPECIFICATIONS

DAARLO-74-R-0034

PAGE 18 OF 33

SCOPE OF WORK

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I. Objective: The contractor shall accomplish prove-out of the automated assembly line for the M125A1 Booster/M564, M565 Delay Arming Mechanism by fabricating then assembling 10,000 M564 Delay Arming Mechanisms of the line:

Determine that the line will function at the design rate of 5,000 acceptable assemblies/day.

Collect production data for incorporation into the final report.

II. Background: Facilities project #5736306 accomplished design, fabrication, and de-bug of an automated assembly line to assembly M125A1 Boosters and M564/M565 Delay Arming Mechanism. The machines which constitute the line are identified as follows:

<u>Machine #</u>	<u>Description</u>
1	Spacer, Pin & Plate Assembly
2	Pallet Assembly
4	Escape Wheel & Pin. Assembly
6	No. 1 Gear & Pin. Assembly
9	Rotor Ream
10	Movement Module Assembly
11	Body & Module Assembly
12	Spin Test Line
13	Setback Assembly
14	Setback Assembly Test
15	3,000 RPM Test

The sequence of operations for each machine is as follows:

<u>Machine No. 1</u>	<u>Station No.</u>	<u>Operation Performed</u>
	1	Feed & Place Spacer
	2	Probe Spacer
	3	Feed & Press Fit Spacer Dowel #1
	4	Feed & Press Fit Spacer Dowel #2
	5	Probe Height of (2) Spacer Dowels
	6	Feed & Place Bottom Plate
	7	Probe Bottom Plate
	8	Drive Screw #1
	9	Drive Screw #2
	10	Stake (2) Screws
	11	Eject Assembly

CONTINUATION SHEET

DAK10-79-R-0034

PAGE 19 OF 55

PART II--SECTION F--DESCRIPTION/SPECIFICATIONS

PALLET ASSEMBLY, MACHINE #2

- Station 1. Feeder bowl and placement mechanism - places pins (2) into nest.
- Station 2. Probe station - probes for missing parts.
- Station 3. Vacant.
- Station 4. Feeder bowl and placement mechanism - orients and places pallet on nest.
- Station 5. Probe station - probes for missing parts.
- Station 6. Vacant.
- Station 7. Vacant.
- Station 8. Feeder bowl and placement mechanism - orients, places and stakes shaft and pins.
- Station 9. Probe station - probes for missing parts.
- Station 10. Vacant.
- Station 11. Eject station - removes part from nest.
- Station 12. Probe station - probes empty station.

CONTINUATION SHEET

DRAK10-79-R-000.

PAGE 20 OF 55

PART II--SECTION F--DESCRIPTION/SPECIFICATIONS

WHEEL AND PINION ESCAPEMENT ASSEMBLY, MACHINE #4

- Station 1. Feeder bowl and placement mechanism - places pinion in nest.
- Station 2. Probe station - probes for missing parts.
- Station 3. Feeder bowl and placement mechanism - places and orients wheel on nest.
- Station 4. Probe station - probes for missing parts.
- Station 5. Stake station - stakes wheel and pinion.
- Station 6. Eject station - removes part from nest.
- Station 7. Probe station - probes empty nest.
- Station 8. Vacant.

CONTINUATION SHEET

DAK10-79-R-0034

PAGE 21 OF 55

PART II--SECTION F--DESCRIPTION/SPECIFICATIONS

#1 GEAR AND PINION ASSEMBLY, MACHINE #6

- Station 1. Feeder bowl and placement mechanism - places pinion on nest.
- Station 2. Probe station - probes for missing part.
- Station 3. Feeder bowl and placement mechanism - places and orients #1 Gear on nest.
- Station 4. Probe station - probes for missing part.
- Station 5. Stake station - stakes #1 Gear and Pinion.
- Station 6. Eject station - removes part from nest.
- Station 7. Probe station - probes empty nest.
- Station 8. Vacant.

CONTINUATION SHEET

DAKLO-79-R-004

PAGE 22 OF 55

PART II--DESCRIPTION/SPECIFICATIONS

<u>Machine No. 9</u>	<u>Station No.</u>	<u>Operation Performed</u>
	1	Ream Rotor
<u>Machine No. 10</u>	<u>Station No.</u>	<u>Operation Performed</u>
	1	Place Spacer & Bottom Plate Assembly
	2	Oil Bottom Plate & Probe
	3	Feed Pallet Assembly
	4	Feed Wheel & Pinion Escapement Assembly
	5	Feed #1 Gear & Pinion Assembly
	6	Feed Safety Rotor Block #1
	7	Feed Safety Rotor Block #2
	8	Feed Rotor-Manual
	9	Feed Upper Safety Block Spring-Manual
	10	Feed Lower Safety Block Spring-Manual
	11	Feed Top Plate
	12	Drive #1 Screw
	13	Probe Top Plate & Pivots
	14	Drive #2 Screw
	15	Drive #3 Screw
	16	Stake 3 Screws
	17	Oil Top Plate
	18	Eject Assembly
<u>Machine No. 11</u>	<u>Station No.</u>	<u>Operation Performed</u>
	1	Place Movement Assembly in Body - Manual Operation
	2	Drive Screw #1
	3	Drive Screw #2
	4	Stake (2) Screws
	5	Probe for Correct Height (4.3.2.39 Maj. 101)
	6	Remove Assembly & Tray-Manual Operation

CONTINUATION SHEET

DAAK10-14-R-0034

PAGE 21 OF 33

PART II--SECTION F--DESCRIPTION/SPECIFICATIONS

SPIN TEST LINE, MACHINE #12

- Station 1. Operator loads body to pallet.
- Station 2. 2000 RPM Spin Test Machine - will transfer body from pallet to spin test spindle. After spinning, machine will transfer body back to next pallet. (4.3.3.10.1 & 4.4.10.1) 100% by Manufacturing.
- Station 3. Orient body on pallet - machine turns body on pallet at reasonable RPM to orient correctly on pallet for probe station.
- Station 4. Probe station for arming - machine probes body and signals if module is armed. If no signal, eject mechanism will eject bad part from line.
- Station 5. Reset spin 630 RPM to non-arm - machine has single nest spin arm, located over pallet which carries module. Bottom lift mechanism raises pallet to spin arm and transfers module to arm. After spinning (630 RPM), arm returns to same pallet at same location from which it is started by stepping motor. Module is transferred back to same pallet by stripping mechanism from above.
- Station 6. Probe station for non-arm - machine probes rotor and signals if module is unarmed. If no signal, eject mechanism will eject bad part from line.
- Station 7. Take-off station to belt, Conveyor #1 - automatic mechanism removes body from pallet and deposits to flat belt line to 3000 RPM Machine.
- Station 8. Placement Station - parts reach station by belt, Conveyor #2, from 3000 RPM Machine #15. Mechanism places body on pallet line automatically.
- Station 9. 1000 RPM Non-Arm Spin Test - machine will transfer body from pallet to spin test spindle. After spinning, machine will transfer body back to next pallet. (4.3.3.10.3 & 4.4.10.3) 100% by Quality Control.
- Station 10. Operator shall be located between Station #9 and Station #10, to visually view spin locks on Station #10. Pallet stop at Station #10 will be in closed position at all times. When viewing from top at the 1000 RPM spin, operator has to push accept control button to open stop (if part is good). If part is bad, control button is not pushed. After spin pallet moves out and stops at Station #10. Operator removes bad part. Empty pallet is automatically released from station.
- Station 11. Take-off Station - mechanism removes body from pallet and deposits on chute to marking machine.
- NOTE: Operator required at marking machine, as parts have to be placed on marking machine.

CONTINUATION SHEET

DAAKLO-79-R-002

PAGE 24 OF 55

PART II--SECTION F--DESCRIPTION/SPECIFICATIONS

SET-BACK MECHANISM ASSEMBLY, MACHINE #13

- Station 1. Feeder bowl for set-back screw - feeds parts on inline vibratory track.
- Station 2. Operator - loads spring into set-back screw.
- Station 3. Screw and spring assembly - feed into second identical vibratory track assembly and is escaped into position on holding fixture.
- Station 4. Feeder bowl for set-back pin - feeds parts on inline vibratory track. Pin is escaped into position on holding fixture.
- Station 5. Feeder bowl for set-back cover - feeds part on inline vibratory track over pin.
- Station 6. Pin and cover is positioned in staking mechanism over a screw and spring assembly and staked. Part ejected into good chute.
- Station 7. If pin and cover assembly are not placed inside screw and spring assembly or if parts are missing, staking mechanism will not stake and parts will be ejected into reject chute.

CONTINUATION SHEET

PART II--SECTION F--DESCRIPTION/SPECIFICATIONS

DAAK10-79-K-0054

PAGE 25 OF 55

TEST LOAD OF SET-BACK MECHANISM ASSEMBLY, MACHINE #14

- Station 1. Feeder bowl and placement mechanism - place set-back mechanism assembly on nest.
- Station 2. Vacant.
- Station 3. Probe station - probes nest for missing parts.
- Station 4. Check mechanism - checks for proper dimension (.196"). If found bad, the check station sets up a signal for eject at Station 10.
- Station 5. Vacant.
- Station 6. Vacant.
- Station 7. Check Station - mechanism with 7.6 gram weight checks set-back pin for proper deflection. If found bad, the check station sets up a signal for eject at Station 10. (4.3.3.7 & 4.4.7).
- Station 8. Vacant.
- Station 9. Vacant.
- Station 10. Eject station - ejects bad parts from nest.
- Station 11. Take-off station - removes good parts from nest.
- Station 12. Probe station - probes for empty nest.

CONTINUATION SHEET

DRAK10-79-R-0054

PAGE 26 OF 55

PART II--SECTION F--DESCRIPTION/SPECIFICATIONS

SET-BACK MECHANISM ASSEMBLY - FINAL ASSEMBLY TO BODY (INCLUDING 3000 RPM SPIN TEST), MACHINE #15

- Station 1. Parts reach Machine #15 by Conveyor #1. Operator manually loads body.
- Station 2. Vacant.
- Station 3. Feeder bowl and placement mechanism places - set-back mechanism into body.
- Station 4. Probe for missing part from top.
- Station 5. Staking station stakes - set-back assembly to body.
- Station 6. Vacant.
- Station 7. 3000 RPM Spin Station - body lifted out of nest and spun and replaced on nest. (4.3.3.10.2 & 4.4.10.2) 100% by Quality Control.
- Station 8. Orient Station (body) - turned on nest to proper position.
- Station 9. Probe Station - probe from bottom for non-arm position and reset.
- Station 10. Reject Station - eject bad units.
- Station 11. Vacant.
- Station 12. Same Operator unloads good units to conveyor. Conveyor #2 returns parts to Machine #12, Station 8.

II General

Upon receipt of Contract DAAK10-79-C-0239 by Westclox Military Products, La Salle, Illinois, the production requirements were released internally by means of a manufacturing order issued by the Contracts Administration Department. As a follow-on to the manufacturing order, the Engineering Department issued a bill of materials, the Manufacturing Engineering Department issued operation sheets, and the Material Control Department released work decks (instructions for actual manufacturing, processes, etc.) to the various manufacturing departments.

Beginning in 1979 when the bill of material was received, Quality Control Engineering started writing "Inspection Procedure Sheets". This entailed accumulating operation sheets, gage sheets and blueprints, which contained the information required to prepare the "Inspection Procedure Sheets". Once these sheets were prepared and approved, our Inspection Plan was assembled and submitted to the local DCASMA Quality Assurance Representative for approval (approval received 5-2-80 - see Attachment A).

Piece parts and sub-assemblies, other than those to be assembled on the automated equipment, were manufactured on a continuing basis with the parts and sub-assemblies manufactured for the M564 Fuze (Contract DAAA09-79-C-0030).

A list of the gages to be used on this contract was submitted to the local DCASMA Quality Assurance Representative for approval by Westclox letter, SER 80-137 dated 2-11-80, by our Gage Division and was approved by the Q.A.R. on 2-19-80 (See Attachment B).

A list of the test equipment designs, previously approved, was submitted to the local DCASMA Quality Assurance Representative for approval under this contract by Westclox letter SER 80-308 dated 4-25-80, by our Test Equipment Department and was approved 5-2-80 per letter DCRI-GCQSA/B. Harmon (See Attachment C).

During the time the parts and sub-assemblies were being inspected and after the time the Quality Plan was approved, Quality Control Engineering began assembling the information and setting up the forms for the log books required per the Scope of Work (See Attachment D).

The Product Assurance Test, Demonstration and Evaluation Plan (Item A003 of DD Form 1423) was completed in April 1980 and submitted to the Government for approval. It was found unsatisfactory and returned in June 1980. A new plan was written incorporating changes requested by the Government in ARRADCOM letter, DRDAR-PRW-A, dated JUN 11, 1980, and during a visit by Mr. L. Spring and Mr. T. McKimm, ARRADCOM, with the assistance and guidance of these Government personnel and re-submitted for Government approval.

During debugging and prove out of the machines comprising the automated line, the required information was logged in the log book, and the parts were submitted to Inspection for lot sampling inspection.

III Work Performed/Machine Status

Following is information relative to each machine comprising the automated line.

Machine #1 - Spacer, Pin and Plate Assembly

Station #1 - Feed & Place Spacer - Limit switches and timers were adjusted for proper operation.

Station #5 - Probe Height of Spacer Dowels - This production test station, which measures for a maximum height of .040" and a minimum calculated height of .0272", has been set up and is working properly. Calibration instructions have been written and posted at the station. Key personnel have been instructed on proper calibration procedures. The problem of keeping this test station in proper adjustment was resolved once all the pallets were properly adjusted.

Station #6 - Feed & Place Bottom Plate - The feeder bowl was changed to feed the new design plates with the two shear forms in lieu of plates with the two dowels. This station still requires considerable attention by an operator.

The remaining stations perform satisfactorily; however, periodically will jam and, thus, require surveillance.

Machine #1 had been debugged and the demonstration test run was scheduled for the week of August 11, 1980, under Government cognizance. However, this demonstration test was not conducted due to lack of sufficient remaining funds under the contract to cover this test.

Machine #2 - Pallet Assembly

Station #1 - Feeder Bowl & Placement Mechanism - places pins (2) into nest - The push-off pins would become magnetized after a period of time and pull pins out of the nest. This was resolved by chrome plating the push-off pins.

Station #4 - Feeder Bowl and Placement Mechanism - orients and places pallet on nest - This station required the use of an additional air valve along with considerable adjusting and alignment of the optical-electronic sensor which is used in conjunction with the Jetron air valve. Once this was accomplished,

it worked very well. The Tooling Stop Indicator Light, Shaft Missing Indicator Light, and Emergency Stop Switch were connected back into their respective circuits so as to be operative. Engineers at CAMCO were consulted on how to properly adjust dwell on their motor drive system and it was adjusted accordingly.

Station #5 - Probe Station - probes for missing parts - A complete new probe was built to insure that not only was the pallet fed into the nest, but that it was fed in the proper direction.

Station #12 - Probe Station - probes empty station - A complete new probe was built to insure that pins were staked and not left in the nest. Formerly, the probe only indicated if the pallet shaft was left in the die and did not probe for the pins. If pins were still in the die, it would cause a jamming condition when the nest rotated to the feed pin station.

All the pallets on this machine were modified so as to hold the push-off torque requirements for the staked shaft.

The limit switches at all stations were properly adjusted after the additional new probes were operable.

A test run in the presence of Mr. T. McKimm, DRDAR-LCN-T, ARRADCOM-Dover, was made and accepted. A procedure report (Appendix A) of this test run is attached.

Machine #4 - Escape Wheel and Pinion Assembly

Station #3 - Feeder Bowl and Placement Mechanism - places and orients wheel on nest - A safety switch was added to insure that the table could not rotate until all tools had receded to the free position. The switch was checked and adjusted for proper operation.

All switches were checked and/or adjusted for proper operation.

Engineers at CAMCO were consulted on how to properly adjust dwell on their Motor Drive System and dwell adjusted accordingly.

All stations work well on this machine. It is necessary, however, that parts be thoroughly cleaned and scrap be sorted from the parts before being placed in the feeder bowls. The biggest problem encountered was scrap and half parts jamming in the feeding tracks.

A test run in the presence of Mr. T. McKimm, DRDAR-LCN-T, ARRADCOM-Dover, was made and accepted. A procedure report (Appendix B) of this test run is attached.

Machine #6 - #1 Gear and Pinion Assembly

Station #3 - Feeder Bowl and Placement Mechanism - places and orients

#1 Gear on nest - A safety switch was added to insure that the table could not rotate until all tools had receded to the free position. This switch was checked and adjusted for proper operation.

All switches on this machine were checked and/or adjusted for proper operation.

Engineers at CAMCO were consulted on proper adjustment of the dwell on their Motor Drive System. CAMCO Motor Control Board was modified in order to suppress electrical pulse that was causing an unwanted table indexing when power switch was turned on.

All stations on this machine work well. As on Machine #4, all parts should be thoroughly cleaned and sorted from scrap.

A test run in the presence of Mr. T. McKimm, DRDAR-LCN-T, ARRADCOM-Dover, was conducted and accepted. A procedure report (Appendix C) of this test run is attached.

Machine #9 - Rotor Ream

This machine had been used in Westclox's production run and did not require any debugging.

A test run in the presence of Mr. T. McKimm, DRDAR-LCN-T, ARRADCOM-Dover, was conducted and accepted. A procedure report (Appendix D) of this test run is attached.

Mr. McKimm suggested that certain reworking be done on this machine to increase its efficiency, (1) redesign the feeder bowl to feed parts faster, and (2) relocate the counter to insure a more accurate count. This rework remains to be accomplished as it was not intended to perform this additional work under this contract since this is considered to be beyond the contract scope of work.

Machine #10 - Movement Module Assembly

Station #3 - Feed Pallet Assembly - New pallet design will require adjustments for proper operation.

Station #11 - Feed Top Plate - Feeder bowl for feeding the top plate was reworked so as to feed the plate with the two shear forms in lieu of the plate with the two dowels. It was later noted that the two shear forms interfered with the sliding fingers used to hold the gears upright. It is our opinion this will require tooling to flatten the shear forms after the plate has been oriented in the feeding track and just prior to being picked up for transfer to the pallet. The tooling described above has been built but not tested on required station.

This machine would require a minimum of two weeks for additional debugging depending upon the problems encountered with feeding the top plate.

The balance of the stations on this machine should require adjusting only since assemblies were made on this machine with the old style plates (dowel forms). Some parts were run down this line, bypassing the feed plate station, and we found that some adjustment is necessary.

Machine #11 - Body and Module Assembly

Station #5 - Probe for Correct Height (4.3.2.39 Major 101) - Calibration instructions have been written and posted inside Sheffield Modulaire Box. Instructions denote the proper use of Gage #426515 in conjunction with Sheffield Modulaire to measure for a maximum height of .835" as required by the purchase description. This station has been determined to be operating properly and key personnel have been instructed on proper calibration procedures.

This machine had been in use in Westclox's production run and should require only minor adjustments since no changes were made which would affect it.

Machine #12 - Spin Test Line

Station #2 - 2,000 RPM Spin Test - This station was checked for proper calibration and operation and found to meet specifications.

Station #5 - Reset Spin 630 RPM to Non-Arm - This station required the installation of a shielded cable and a .047 MFD capacitor in the photocell circuit in order to attenuate suppurious pulses which occasionally caused the arm to stop in the wrong position.

Station #9 - 1,000 RPM Spin Test - This station was checked for proper calibration and operation, and found to meet specifications.

All other switches have been checked and/or adjusted for proper operation.

It was necessary to check and rework the pallets for this machine as it was found that 50% of the pallets had to be repaired to use bodies that ran on the

low side of the tolerance and and were tight on the pallet. Some bodies fit so tight they could not be removed automatically from the pallet.

This station has been debugged about 50% and may require an additional two weeks for debugging.

Although work was performed on each station of Machine #12, the whole line was not operated as a unit and it is our opinion that approximately six months would be required to synchronize all stations on the line to run as a single unit.

Machine #13 - Setback Mechanism Assembly

Station #1 - Feeder Bowl for Setback Screw - feeds parts on inline vibratory track - The feeder bowl and track for feeding the setback housing were reworked to use the new setback housing configuration (without a thread). It took considerable debugging of adjustments and changes to the track to get the housing to feed properly, in particular, at the end of the feed track.

Station #4 - Feeder Bowl for Setback Pin - feeds parts on inline vibratory track. Pin is escaped into position on holding fixture - The feeder bowl for feeding the pins had to be reworked to prevent jamming of pins by piggybacking.

Station #5 - Feeder Bowl for Setback Cover - feeds part on inline vibratory track over pin - The shuttle mouth for feeding the cover onto the pin required reworking to prevent the pin and cover from toppling. Previously, this sub-assembly would topple and jam the feeding track. An arm or step was added to balance the cover on the pin as it was advanced in the track.

All electronics work well on this machine.

This machine has been debugged and is ready for a test run. We ran approximately 14,000 assemblies on this machine during the course of debugging.

Machine #14 - Setback Assembly Test

Station #1 - Feeder Bowl and Placement Mechanism - place setback mechanism assembly on nest - The feeder bowl and track for feeding the setback assembly have been

reworked to use setback assemblies without the threaded housing. Several minor adjustments had to be made to the feeder bowl.

Station #4 - Check Mechanism - checks for proper dimension (.196") - An aluminum collar on the proximity sensor had to be changed to a stainless steel collar. The aluminum material was affecting the sensitivity of the magnetic field of the proximity switch, causing a problem in keeping this station in proper calibration. Further stability was achieved by lowering the sensor head of the proximity switch, so as to narrow the gap between the sensor and pin tip under test condition. Master was fabricated and calibrated at .196" by the Gage Department. Proximity switch has been calibrated so Master at .196" is a No-Go condition. Dimensions greater than .196" are acceptable Go conditions.

Station #7 - Check Station - mechanism with 7.6 grams weight checks setback pin for proper deflection - This test was found to be working fine and within calibration. Master fabricated and calibrated for a 7.6 gram No-Go condition. Weights less than 7.6 grams are acceptable Go conditions.

This machine has been debugged and is ready for a test run.

Machine #15 - 3000 RPM Test

On Machine #15, all the pallets were modified to suit the new hole in the D.A.M. Body.

The press staking the setback mechanism in the body was modified. The press was not strong enough and distorted with the pressure required to perform the staking operation.

The feeder bowl and track on Station #3 for feeding the setback assembly into the body was reworked so as to use the new configuration setback assemblies with non-threaded housings. We found that the feeder bowl and track perform satisfactorily but the setback assemblies do not feed into the bodies properly.

Presently, the fuze body is located on the pallet nest through the movement front plate. Two pins on the nest locate the front plate. Three screws locate the front plate on the spacer. Two screws locate the spacer on the body. Because of a tolerance buildup on these locating points, we get a wide variation in the positioning of the setback assembly hole in relationship with the feeding of the setback assembly.

Also, presently the nests are free to float on the rotating table. They are locked in position at Station #3 by a pin from beneath the table. It appears that a new method of positioning and locking the nests must be tooled. This positioning must come from above the table and off Station #3.

Station #7 - 3000 RPM Test - This station has been checked for proper calibration and operation, and found to meet specifications.

On Rotary Index Machine for setback mechanism, (1) setback mechanism insert equipment was modified, (2) new punch for staking the setback mechanism was built, and (3) the air cylinder was modified.

All other stations appear to be functioning properly except for Station #1 which will require considerable rework.

IV Summary

Work on this contract was stopped when funding limitations were reached and Westclox agreed to prepare and furnish the final report to document the work done so as to identify work actually accomplished. This, along with TDP, previously furnished, should establish a complete baseline for the lines. This report was prepared to accomplish this objective. Drawings of the machines were furnished

under the original contracts. All test stations on the line have been checked, adjusted and calibrated, and are in proper working order. Considerable work of a non-test function nature remains to be done as indicated in this report. Industrial Engineering, Quality Control Engineering, Test Equipment Group, Gage Department and Tool Room participated in all aspects of this project.

V Conclusion

Work was accomplished per the contract according to funding limitations. This is evidenced by test results obtained on Machines #2, #4, #6 and #9. Machines (automated line) will not produce 5,000 units per day on a 1-8-5 basis but work could be done at a later date for this.

VI Recommendation

Debugging of the automated assembly line should be continued. Any recipient of the line would have to be careful to assemble it properly and should realize additional debugging will have to be done. Electronics do not store for extended periods without problems in function. Disassembly of the line should be done with care to prevent damage, loss of components of line, and to facilitate transporting to destination and reassembly of the line.



DEFENSE SUPPLY AGENCY
DEFENSE CONTRACT ADMINISTRATION SERVICES REGION, CHICAGO
O'HARE INTERNATIONAL AIRPORT, P. O. BOX 65475
CHICAGO, ILLINOIS 60655

IN REPLY
REFER TO

DCRI-CCQSA/B. Harmon

DATE: 2 May 80

RECEIVED

MAY 2 1980

WESTCLOX
Contract Administration
La Salle, Ill. 61301

Westclox Military Products
Talley Industries
La Salle, Illinois 61301

Gentlemen:

Government Representatives of DCASR, Chicago reviewed the written procedures prepared by your firm in accordance with the requirements of contract number DAAK10-79-C-0239. On the basis of this review, there is no objection at this time to the use of these procedures.

This letter does not relieve you in any way from continuing to comply with the requirements of MIL-I-45208A, and the contract. Future evaluation of actual operations may necessitate a change to these written procedures. It is requested that you notify the following office whenever these procedures are revised or changed.

See Below

This notice does not signify a preference for or an endorsement of your product by the Department of Defense and shall not be so used in advertisements or other publicity.

Sincerely,

B. P. Harmon, SQAR
c/o Westclox Military Products
La Salle, Illinois 61301

cc:

Administrative Contracting Officer
Industrial Specialist

FORMAT

DCRI-FL 157
Aug 71

LOGISTICS
DEFENSE SUPPLY AGENCYDEFENSE CONTRACT ADMINISTRATION SERVICES REGION, CHICAGO
O'HARE INTERNATIONAL AIRPORT, P. O. BOX 66475
CHICAGO, ILLINOIS 60665IN REPLY
REFER TO DCRI-GCQSA/B. Harmon, SQAR

19 FEB 80

Mr. M. P. Jones
Contract Administration Manager
c/o Westclox Military Products
La Salle, IL 61301Subject: Acceptance Inspection Equipment Designs, Item A001 of
DD Form 1423, Contract DAAK10-79-C-0239

Reference: Westclox Letter SER 80-137 Dated 2-11-80

A review of subject contract and Gage Approval List for Contract DAAA09-77-C-0175, has been made by this office. As no new gage designs are to be used, this office concurs with the approved gage list as submitted.

B. P. Harmon, SQAR
DCASMA-Chicago
c/o Westclox Military Products
La Salle, IL 61301

WESTCLOX[®] Talley
MILITARY PRODUCTS Industries

IN REPLY REFER TO: SER 80-137

EAWalsh:ew
2-11-80

Mr. B. P. Harmon, SQAR
DCASMA-Chicago
c/o Westclox Military Products
La Salle, Illinois 61301

Subject: Acceptance Inspection Equipment Designs, Item A001 of DD Form 1423

Reference: Contract DAAK10-79-C-0239, Automated D.A.M. Assembly, F10520702 Rev. L,
of MTSQ M564 Fuze (P.D. MIL-F-14847B (MU) w/Amend. #4)

Gentlemen:

To comply with the requirements of Paragraph F.2.1.B of Contract -0239, as modified during the Post Award Conference held at Westclox on 11-7-79 to the effect that, "Acceptance Inspection Equipment Designs already approved need not be submitted - submit a list of approved designs to the Resident Government SQAR", enclosed is Westclox Submission No. 1, dated 2-6-80, 3 Sheets, Acceptance Inspection Equipment List for Critical and Major Categories, applicable to the referenced D.A.M. Assembly.

All gages to be used for this project have had their design approved for use on Contract DAAA09-77-C-0175, M564 Fuze, via Government Forms DRDAR-QA Form 337 (Evaluation of Acceptance Inspection Equipment Designs). The last of the designs were approved on March 24, 1978. No new designed gages will be used on the referenced contract.

It is requested you furnish your concurrence to the use of the gages as listed on Submission No. 1 by 2-18-80.

If additional information is required, please contact Mrs. E. Walsh or the undersigned.

Yours very truly,



M. P. Jones
Contract Administration Manager

Encl: Submission No. 1, 3 Sheets (1 Copy)

CC w/encl: ARRADCOM-Dover, N.J. 07801, Attn: DRDAR-QAR

CC w/o encl: Mr. W. Ashby, PCO, DRSAR-PCA-F, ARRCOM-Rock Island, Ill. 61299
Mr. F. Nissen, DRDAR-LCN-T, ARRADCOM-Dover, N.J. 07801
Mr. E. Roback, ACO, DCRI-GCCA/AJ, DCASMA-Chicago, Ill. 60666
Mr. F. Ruhmann, DRCFM-PBM-M, ARRADCOM-Dover, N.J. 07801
Mr. L. Springer, DRDAR-QAR-E, ARRADCOM-Dover, N.J. 07801
Mr. C. Wolinski, DRSAR-QAM-S, ARRCOM-Rock Island, Ill. 61299
Mr. F. Baldinger, DRDAR-PRW-A, ARRADCOM-Dover, N.J. 07801

Westclox Military Products
 Westclox Industries
 Chicago, Ill. 61301

ACCEPTANCE
 Inspection Equipment List For Critical & Major Categories

FOR:

AUTOMATED D.A.M. ASS'Y. F10520702 REV. L OF THE MTSC
 H561 FUZE (P.D. MIL-F-11847R (MIL) w/APPEND. #1)
 CONTRACT NO. DAAK10-79-C-0239 WESTCLOX MODEL NO 7517

QTY. AND CATEGORY NO.	PART NAME & GOVT. NO. W/REV.	WTX. PART NO.	PARA. REF./ METHOD OF INSPECTION	WTX. PROPERTY NUMBER	WTX. I.E. DESIGN/ NO. OR C.E.
2.23	Escapement Wheel & Pinion Ass'y D11713967 Rev. A	(Mod. 75157) 82933			
101			Gage	h263h1	3-1102
102			Gage	h261h62	2-177h
				(Gen. Insp.)	w/C.E.
2.24	No. 1 Gear & Pinion Ass'y. F10523167 Rev. C	(Mod. 75157) 82936			
101			Gage	h263h1	3-1102
102			Gage	h261h62	2-177h
				(Gen. Insp.)	w/C.E.
2.25	Adapter Escape Wheel C8595539 Rev. R	(Mod. 75157) 78711			
101			Gage	h268h15-1	3-1113 w/C
2.26	Pallet Ass'y. D11713962 Rev. C	(Mod. 75157) 82934			
101			Gage	h261h62	2-177h
				(Gen. Insp.)	w/C.E.
2.27	Laminated Rotor Ass'y. F10551356 Rev. C	(Mod. 75175) 83052			
101			Gage	h263h1	3-1102
102			Gage	h261h62	2-177h
				(Gen. Insp.)	w/C.E.

tical & Major Categories

REV. L OF THE MTSQ
w/APPEND. #1)
MCLOX MCDEL NO 75175

Sheet 1 of 3
Date 2/6/80
Submission (on) 1/2, 1

TX.I.E. DESIGN/FILE
NO. OR/C.E.

C.E. DATA OR COMMENTS

3-1102
2-177h
w/C.E.

** Taft Pierce Cone., & Squareness Fixt.,
use w/Surf., Plate & Dial Indicator Mounted to
Height Check Stand.

3-1102
2-177h
w/C.E.

(Same as ** Above,)

3-1113 w/C.E.

Chart 50X use w/Hausser Proj. Mod. D-215.

2-177h
w/C.E.

(Same as ** Above)

3-1102
2-177h
w/C.E.

(Same as ** Above)

ATTACHMENT B

PAGE 154

Stelox Military Products
Inc. Industries
Salle, Ill. 61301

ACCEPTANCE
Inspection Equipment List For Critical & Major Cat

FOR: _____

AUTOMATED D.A.N. ASS'Y. F10520702 REV. 1 OF THE M
 M56L FUZE (P.D. MIL-F-11847D (M) w/AMEND. #1)
 CONTRACT NO DAAK10-79-C-0239 WESTCLOX MODEL NO. 75

A. AND SECURITY NO.	PART NAME & GOVT. NO. W/REV.	WTX. PART NO.	PARA. REF./ METHOD OF INSPECTION	WTX.PROPERTY NUMBER	WTX.I.E. DESIGN NO. OR/C.R.
3.2.28	Body Delay Arming Mechanism (D.A.M.)	(Mod. 75161) 79050			
1	F10520703 Rev. L		Gage	h27850	C.F.
2			Gage	h278h6	C.F.
101			Gage	h278h7	C.F.
				h278h8	C.F.
102			Gage	h26306	C.F.
				h26307	C.F.
103			Gage	h26300	C.F.
				h26301	C.F.
104			Gage	h28hh0	2-1953
3.2.39	Delay Arming Mechanism Ass'y. F10520702 Rev. L	(Mod. 75175) 830h9			
101			Gage	h2635h	2-1756
3.3.1	Adapter Escape Wheel C0595539 Rev. R	(Mod. 75157) 7871h			
None			h.h.l Hardness (Destructive)	Tukon Hardness Tester	C.F.
	Pin. Pallet B117h3965 Rev. C	(Mod 751h2) 78h31			
None			h.h.l Hardness (Destructive)	Tukon Hardness Tester	C.F.

1 & Major Categories

Sheet 2 of 3
Date 2/6/80
Submission No. 1

1. L OF THE HTSQ
WEND. #1)
MODEL NO. 75175

TX.I.E. DESIGN/FILE
NO. OR/C.R.

C.E. DATA OR COMMENTS

C.E.	NoGo A.G.D. Snap w/Extended Anvil.
C.E.	NoGo Plain Plug.
C.E.	Go Thrd. Ring. (Thrd., Set Plug h15508).
C.E.	NoGo Thrd., Ring. (Thrd., Set Plug h15508).
C.E.	Go Plain Ring.
C.E.	NoGo A.G.D. Snap w/Extended Anvil.
C.E.	Go Thrd., Ring (Thrd. Set Plug h26330).
C.E.	NoGo Thrd., Ring (Thrd., Set Plug h26331).

2-1953

2-1756

C.E.

C.E.

ATTACHMENT B

Page 15

Westclox Military Products
 Valley Industries
 Salle, Ill. 61301

ACCEPTANCE
 Inspection Equipment List For Critical & Major Cal
 FOR:-
 AUTOMATED D.A.M. ASS'Y. F10520702 REV. L OF THE M
 M561 FUZE (P.D. MIL-F-14847B (MIL) w/AMEND. #4)
 CONTRACT NO DAAK10-79-C-0239 WESTCLOX MODEL NO. 75

PARA. AND CATEGORY NO.	PART NAME & GOV'T. NO. W/REV.	WTX. PART NO.	PARA. REF./ METHOD OF INSPECTION	WTX. PROPERTY NUMBER	WTX. I.E. DESIGN NO. OR/C.E.
3.3.5.1	Wheel & Pinion Escapement Ass'y. (D.A.M. ASS'Y.)	(Mod 75157)			
	D11743967 Rev. A	82933			
None			4.4.5 Static Load	K & E Anvil Block	C.E.
	No. 1 Gear & Pinion Ass'y. (D.A.M. Ass'y.)	(Mod. 75157)			
	D10523167 Rev. C	82936			
None			4.4.5 Static Load	K & E Anvil Block	C.E.
	Pallet Ass'y. (D.A.M. Ass'y.)	(Mod. 75157)			
	D11743962 Rev. C	82934			
None			4.4.5 Static Load	K & E Anvil Block	C.E.
	D.A.M. Assembly	(Mod. 75175)			
	F10520702 Rev. L	83049			
None			4.4.5 Static Load (Push on Set- Back Mech. Ass'y.)	430805 w/C.E.	2-2248 w/C.E.
3.3.7	SetBack Mechanism Ass'y.	(Mod 75175)			
	F10551357 Rev. B	83051			
None			4.4.7	424993 424994	3-1083

Major Categories

Sheet 3 of 3

Date 2/6/80

Submission No. 1

OF THE MISQ

ND. #1)

EL NO. 75175

I.E. DESIGN/FILE
OR/C.3.

C.E. DATA OR COMMENTS

C.E.

Link Spring Tester Mod. PR3-50.

C.E.

Link Spring Tester Mod. PR3-50.

C.E.

1-Pins-Link Spring Tester Mod. PR3-10.
2-Shaft-Link Spring Tester Mod. PR3-50.

2-2248
w/C.E.

Link Spring Tester Mod. LH-250

3-1083

Attachment B

Page 1501



Logistics
DEFENSE/SUPPLY AGENCY
DEFENSE CONTRACT ADMINISTRATION SERVICES REGION, CHICAGO
O'HARE INTERNATIONAL AIRPORT, P. O. BOX 66475
CHICAGO, ILLINOIS 60666

IN REPLY
REFER TO

DCRI-GCQSA/B. Harmon, SQAR

2 May 80

RECEIVED

Mr. M. P. Jones
Contract Administration Manager
c/o Westclox Military Products
La Salle, Illinois 61301

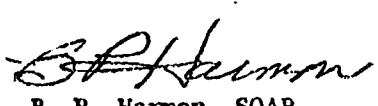
MAY 5 1980

WESTCLOX
Contract Administration
LaSalle, Ill. 61301

Subject: Acceptance Inspection Equipment Designs, Item A001
of DD Form 1423, Contract DAAK10-79-C-0239

Reference: Westclox Letter SER 80-308 Dated 4-25-80

A review of subject contract and referenced letter attachment Submission No. 2, subject designs, has been made by this office. As no new designs are to be used, this office concurs with the approved test equipment list as submitted.


B. P. Harmon, SQAR
DCASMA-Chicago
c/o Westclox Military Products
La Salle, Illinois 61301

WESTCLOX®
MILITARY PRODUCTS | **Talley**
Industries

IN REPLY REFER TO: SER 80-303

EAWalsh:sg
4/25/80

Mr. B.P. Harmon, SQAR
DCASMA-Chicago
c/o Westclox Military Products
LaSalle, Illinois 61301

Subject: Acceptance Inspection Equipment Designs, Item A001 of DD Form 1423

Reference: Contract DAAK10-79-C-0239, Automated D.A.M. Assembly, F10520702 Rev. L,
of MTSQ M564 Fuze (P.D. MIL-F-14847B (MU) w/Amend. #4)

Gentlemen:

To comply with the requirements of Paragraph F.2.1.B of Contract -0239, as modified during the Post Award Conference held at Westclox on 11/7/79 to the effect that, "Acceptance Inspection Equipment Designs already approved need not be submitted - submit a list of approved designs to the Resident Government SQAR", enclosed is Westclox Submission No. 2, dated 4/25/80, 1 Sheet, Acceptance Inspection Equipment List for Critical and Major Categories, applicable to the referenced D.A.M. Assembly.

All inspection equipment and gages to be used for this project have had their design approved by cognizant Government personnel for M564 Fuze, as shown under C.E. Data or Comments column on enclosed Submission No. 2.

If you desire to view the designs, please contact Mr. G. Masini of the Westclox Test Equipment Department.

It is requested you furnish your concurrence to the use of this inspection equipment as listed on Submission No. 2 by 5/2/80.

If additional information is required, please contact Mrs. E. Walsh or the undersigned.

Yours very truly,



M.P. Jones

Contract Administration Manager

Enc.: Submission No. 2, 1 Sheet (1 copy)

cc w/enc.: ARRADCOM-Dover, N.J. 07801, Attn: DRDAR-QAR

cc w/o enc.: Mr. W. Ashby, PCO, DRSAR-PCA-F, ARRCOM-RI

Mr. T. McKinn, DRDAR-LCN-T, ARRADCOM-Dover

Mr. E. Roback, ACO, DCRI-GCCA/AJ, DCASMA-Chicago

Mr. F. Ruhmann, DRCPM-PPM-N, ARRADCOM-Dover

Mr. L. Springer, DRDAR-QAR-E, ARRADCOM-Dover

Mr. C. Wolinski, DRSAR-QAM-S, ARRCOM-RI

Mr. F. Baldinger, DRDAR-FRW-A, ARRADCOM-Dover

Postolox Military Products
Valley Industries
Salle, Ill. 61301

ACCEPTANCE

Inspection Equipment List for Critical & Major Cat

FOR :-

AUTOMATED D.A.M. ASS'Y F10520702 REV. L OF THE MTS
M564 FUZE (P.D. MIL-F-14847B (MIL) w/AMEND. #4)
CONTRACT NO. DAAK10-79-C-0239 WESTCLOX MODEL NO. 7

PARA. AND FIGURE NO.	PART NAME & GOV'T. NO. W/REV.	WTX. PART NO.	PARA. REF./ METHOD OF INSPECTION	GOV. I.D. NUMBER	WTX.I.E. DESIGN NO. OR/C.F.
3.3.10	Delay Arming mechanism				
4.10	assembly				
3.3.10.1	Spin arming less setback	Mod. 75175	4.4.10.1	3690-03756	110-50
	assembly-(nondestructive)	83049			
	F10520702 Rev. L				
3.3.10.2	Spin, 3000+50 r.p.m. with	Mod. 75175	4.4.10.2	3690-03759	110-60
	setback assembly	83049			
	(nondestructive)				
3.3.10.3	Spin nonarming with	Mod. 75175	4.4.10.3	3690-03756	110-50
	setback assembly	83049			
	(nondestructive)				
	F10520702 Rev. L				
3.2.39	Delay Arming Mechanism	Mod. 75175		3690-02938	
	Ass'y (Automated Line)	83049			
	F10520702 Rev. L				
for 101			Set Master		1-3856
			Gage #426515		
	Calibration and Surveillance				
	Procedures for Set Master				
	Gage #426515				

RECEIVED

APR 25 1980

WESTCLOX

Contract Administration

LaSalle, Ill. 61301

Major Categories

OF THE MTSQ

ID. #4)

MODEL NO. 75175

Sheet 1 of 1

Date 4-25-80

Submission No. 2

C.E. DESIGN/FILE
OR/C.F.

C.E. DATA OR COMMENTS

10-50

This Inspection Equipment
approved by Frankford Arsenal
letter DRDAR-QAA-Q (2)
dated 2 June 1977

10-60

Same as above

10-50

Same as above

3856

Same as above

Approved by SARPA Form 1410
dated 16 Aug. 1977 from ARRADCOM,
DRDAR-QAR-I, Dover, N.J.

ATTACHMENT C

Page 16B

ED

ON

12

PAGE OF

PAGE OF

CAUSE OF DOWNTIME

JWIL.
NMCC

OPERATING TIME

Reflex

**QUANTITY
COMPLETE**

DATE:

ATTACHMENT D

Page 17

PAGE 1 OF 1
CAUSE OF DOWNTIME:

Page 17A

[illegible]

MACHINE DESCRIPTION NO 2[#] PALLET ASSEMBLY

PAGE 1 OF 3

DATE	QUANTITY COMPLETE	REJECT	OPERATING TIME	DOWN TIME	CAUSE OF DOWNTIME
9/30	14	0	46 sec	17 sec	SHUT DOWN TO FILL FEED TRACK
30	76	1	4 MIN 38 sec	14 sec	PALLET MISSING
30	13	1	1 MIN 44 sec	3 sec	PALLET MISSING
	73	1	4 MIN 26 sec	14 sec	PALLET MISSING
	171	1	12 MIN 24 sec	34 sec	PALLET MISSING
	8	1	.30	36 sec	PALLET MISSING
	102	1	6 MIN 2 sec	1 MIN 14 sec	ELECTRONIC EQUIPMENT HANG UP PROBE DID NOT FUNCTION
	53	1	3 MIN 40 sec	7 sec	NEST OCCUPIED WITH SHAFT

APPENDIX A

Page 18

PALLET ASSEMBLY

MACHINE DESCRIPTION NO 2⁴

PAGE 2 OF 3

DATE	QUANTITY COMPLETE	REJECT	OPERATING TIME	DOWN TIME	CAUSE OF DOWNTIME
10/80	70		4 MIN 51 sec	12 sec	NEST OCCUPIED WITH SRAFT
	347		22 MIN 2 sec	11 sec	PALLET MISSING
	283		19 MIN 12 sec	33 sec	(TWO) PALLETS MISSING ONE FOLLOWING THE OTHER IN SUCCESSIVE STATIONS
	110		8 MIN 1 sec	10 sec	PALLET MISSING
	58		4 MIN 2 sec	15 sec	NEST OCCUPIED
	300		19 MIN 23 sec	30 sec	NEST OCCUPIED
	302		20 MIN 26 sec	13 sec	PALLET MISSING
	92		5 MIN 45 sec		BREAK TIME

APPENDIX A

Page 18A

MACHINE DESCRIPTION NO 2nd PALLET ASSEMBLY

PAGE 3 OF 3

DATE	QUANTITY COMPLETE	REJECT	OPERATING TIME	DOWN TIME	CAUSE OF DOWNTIME
9/80	163		15 MIN 53 sec	1 MIN 14 sec	PALLET PIN MISSING
	60		4 MIN 47 sec	26 MIN 30 sec	PALLET PIN MISSING SCRAP IN FEEDER TUBE REMOVED AND CLEANED TUBES
	122		7 MIN 2 sec	1 MIN 22 sec	PALLET MISSING
	22		1 MIN 59 sec	12 sec	PALLET IN NEST BACKWARD
	41		1 MIN	17 sec	PALLET MISSING
	95		6 MIN 12 sec		LUNCH TIME
	TOTAL				
	2575				

APPENDIX A

Page 18B

MACHINE DESCRIPTION No 4^A Escape wheel and Pin. Assembly

PAGE 1 OF 8

DATE	QUANTITY COMPLETE	REJECT	OPERATING TIME	DOWN TIME	CAUSE OF DOWNTIME
7/8/80	70		2 min 33 sec	15 sec	PINION DID NOT STAKE
	24		9 sec	15 sec	PINION DID NOT STAKE
	560		15 min 11 sec	10 sec	PINION DID NOT STAKE
	95		6 min 11 sec	4 min 30 sec	SCRAP IN FEEDER TUBE AND JAMMED CHANNEL
	164		5 min 34 sec	7 min 6 sec	DID NOT ORIENTATE IN DIE
	80		1 min 44 sec	2 min 24 sec	JAM IN CHANNEL
	11		1 min 16 sec	3 min 18 sec	JAM IN CHANNEL
	24		1 min 18 sec	25 sec	JAM IN CHANNEL

APPENDIX B

Page 19

MACHINE DESCRIPTION No 4

Escapee Wheel and Pin. Assembly

PAGE 2 OF 8

DATE	QUANTITY COMPLETE	REJECT	OPERATING TIME	DOWN TIME	CAUSE OF DOWNTIME
7/6/80	74		2 min 14 sec	45 sec.	PINION MISSING
	80		3 min 31 sec.	5 sec.	Wheel MISSING Kicked wheel out FROM wheel FEED STATION
	92		3 min 15 sec.	5 sec.	Wheel MISSING Kicked PART out FROM wheel FEED STATION
	27		1 min 36 sec.	1 min 40 sec	Wheel MISSING Kicked PART out FROM wheel FEED STATION
	110		3 min 10 sec		10: AM BREAK TIME
	76		3 min 5 sec		MACHINE SHUT DOWN FOR REPAIR - TO INVESTIGATE AND REPAIR WHEEL FEED STATION
	TOTAL PRODUCTION 1594				

APPENDIX B

Page 19A

MACHINE DESCRIPTION No 4^d ESCAPE wheel AND PIN. ASSEMBLY

PAGE 3 OF 8

DATE	QUANTITY COMPLETE	REJECT	OPERATING TIME	DOWN TIME	CAUSE OF DOWNTIME
7/9/8 12:15 P.M.	257		8 MIN. 36 sec.	22 sec.	PART CAME OUT OF STAKE STATION PROBE STOPPED MACHINE
	415		14 MIN. 6 sec.	1 MIN 22 sec.	PART JAMMED IN SCREW DRIVER ORIENTATION STATION
	252		8 MIN 47 sec	16 sec	PART PULLED OUT OF STAKE STATION PROBE IN NEXT STATION STOPPED MACHINE DUE TO MISSING PART
	331		12 MIN	1 MIN 23 sec	SCRAP JAMMED IN PINION FEEDER TRACK
	143		5 MIN	8 MIN 35 sec.	PART STUCK IN WHEEL ADVANCE SLIDE TWO WHEELS FOUND IN SLIDE FOUND BROKEN PILOT. DOWN FOR REPAIR
	TOTAL PRODUCTION 1398				

MACHINE DESCRIPTION No 4

ESCAPE wheel AND AN. ASSEMBLY

PAGE 4 OF 8

DATE	QUANTITY COMPLETE	REJECT	OPERATING TIME	DOWN TIME	CAUSE OF DOWNTIME
10/80 2:08 M	720		25 MIN 40 SEC	48 sec	ESCAPE wheel MISSING AT STATION
	460		14 MIN. 34 SEC.	2 MIN 30 SEC.	ESCAPE wheel MISSING AT STATION
	90		2 MIN 53 SEC.	1 MIN 19 SEC	ESCAPE wheel MISSING AT STATION
	97		3 MIN 22 SEC	1 MIN 31 SEC	ESCAPE wheel MISSING AT STATION
	123		3 MIN 53 SEC	2 MIN.	ESCAPE wheel MISSING AT STATION
	174		5 MIN 49 SEC	41 sec	ESCAPE wheel MISSING AT STATION
	426		14 MIN 34 SEC	23 sec	MACHINE SHUT OFF OPERATOR RE LOADED HOPPER
	570		12 MIN 25 sec	12 sec	ESCAPE wheel MISSING AT STATION

APPENDIX B

Page 19C

MACHINE DESCRIPTION No 4 ² Escape wheel AND Pin Assembly

PAGE 5 OF 8

APPENDIX B

Page 19D

DATE	QUANTITY COMPLETE	REJECT	OPERATING TIME	DOWN TIME	CAUSE OF DOWNTIME
7/10/80	160		12 MIN 36 sec	1 MIN 18 sec	
	38		2 MIN 37 sec	1 MIN 20 sec	
	446		15 MIN 22 sec	2 MIN 6 sec	
	94		2 MIN 44 sec	30 sec	
	285		7 MIN 27 sec	12 sec	
	447		15 MIN 54 sec	1 MIN 21 sec	
	160		5 MIN 35 sec	57 sec	
	25		1 MIN 8 sec	2 MIN 5 sec	

ESCAPE wheel AND PIN. ASSEMBLY

PAGE. 6 OF 8

CAUSE OF DOWNTIME

3:PM. MACHINE SHUT DOWN

APPENDIX B

Page 19E

[illegible]

^A
MACHINE DESCRIPTION No 4 Escape wheel AND PN. Assembly

PAGE 7 of 8

DATE	QUANTITY COMPLETE	REJECT	OPERATING TIME	DOWN TIME	CAUSE OF DOWNTIME
4/1/80	16	1	29 sec.	15 sec	Escape wheel MISFED
0:35 AM					
	162	1	5 MIN 49 sec	31 sec	Escape wheel MISFED
	308	1	8 MIN 55 sec	22 sec	Escape wheel MISFED
	333		11 MIN 36 sec		MACHINE SHUT DOWN TO SHARPEN STAKING PUNCH
	TOTAL PRODUCTION				
	819				
4/1/80			11 MIN 8 sec	27 sec	Escape wheel MISFED
0:15	288				
1:00 PM					
	172		23 sec	35 sec	Escape wheel MISFED FED 2 wheels - MISSED ONE PUNCH SHOT OFF MACHINE

Page 19F

APPENDIX B

MACHINE DESCRIPTION No 4

ESCAPE WHEEL AND PN. ASSEMBLY

PAGE 8 OF 8

DATE	QUANTITY COMPLETE	REJECT	OPERATING TIME	DOWN TIME	CAUSE OF DOWNTIME
7/1/80	548		18 MIN. 58 SEC	20 SEC	ESCAPE WHEEL MISFED
	95		3 MIN 33 SEC	29 SEC	ESCAPE WHEEL MISFED
	179		6 MIN 17 SEC	3 MIN 18 SEC	ASSEMBLY MISSING FOUND BAD PROBE SWITCH
	88		1 MIN 50 SEC	1 MIN 3 SEC	ASSEMBLY MISSING BAD PROBE SWITCH - DID NOT DETECT MISSING ASSEMBLY
	106		3 MIN 53 SEC		11:30 AM SHUT DOWN FOR LUNCH
	TOTAL PRODUCTION 1344				

APPENDIX B

MACHINE DESCRIPTION [#] No 6					No 1 GEAR & PINION ASSEMBLY		PAGE 1 OF 2	
DATE	QUANTITY COMPLETE	REJECT	OPERATING TIME	DOWN TIME	CAUSE OF DOWNTIME			
7/8/80 10:37 A.M.	50		1 MIN.	15 sec.	WHEEL MISSING			
	50		45 sec.	18 sec.	DOUBLE ACTION			
	39		1 MIN. 35 sec	40 sec.	WHEEL MISSING			
				40 sec.	TESTING - SINGLE FEED			APPENDIX C
	105		2 MIN. 24 sec	17 sec.	WHEEL MISSING			
	105		1 MIN.	1 MIN. 51 sec	NOT ENOUGH PINIONS IN CHANNEL OPERATOR HAD TO FEED PINIONS TO CHANNEL			
	11		1 MIN. 10 sec.	52 sec.	WHEEL MISSING			
	60		1 MIN. 17 sec.	38 sec.	TROUBLE IN PINION CHANNEL			

MACHINE DESCRIPTION No 6 # No 1 Gear & Pinion Assemblies

PAGE 2 OF 7

DATE	QUANTITY COMPLETE	REJECT	OPERATING TIME	DOWN TIME	CAUSE OF DOWNTIME
	54		1 MIN	1 MIN. 30 SEC	TRouble IN The Wheel Feed Chamber TRouble IN RELEASING PINION
	35		1 MIN 10 SEC	3 MIN.	TRouble IN The Wheel Feed Chamber TABLE DID NOT ORIENTATE WHOL
	50		1 MIN 30 SEC	15 MIN.	BREAK DOWN IN PINION FEED Chamberer ALSO SWITCH PROBLEM
	65		2 MIN 34 SEC		DOWN LUNCH TIME
2/8/80 1.36 P.M.	250		8 MIN 47 SEC	8 MIN 18 SEC	MISFEED PINION IN PINION CHANNEL REMOVED PINION AND RE-LOADED CHANNEL
	24		57 SEC	17 SEC	MISFEED PINION
	77		5 MIN 29 SEC.	3 SEC	MISFEED PINION - PINION LEARNING IN PROBE STATION
	68		2 MIN 38 SEC	2 MIN 17 SEC	MISFEED PINION IN PINION CHANNEL

APPENDIX C

MACHINE DESCRIPTION No 6 No 1 GEAR & PINION ASSEMBLY

PAGE 3 OF 7

DATE	QUANTITY COMPLETE	REJECT	OPERATING TIME	DOWN TIME	CAUSE OF DOWNTIME
1/80	53		2 MIN. 11 sec.	54 sec.	FEEDER TRACK PROBLEM'S
	39		1 MIN. 47 sec.	21 MIN. 4 sec.	FEEDER TRACK PROBLEM'S STUCK ORIENT BLADE ADJUST LEVEL OF FEEDER BOWL AND PINION CHANNEL
	101		3 MIN. 48 sec.	2 MIN. 4 sec.	FEEDER TRACK PROBLEM'S PINION FALLING OVER IN CHANNEL
	286		10 MIN. 8 sec.	2 MIN.	PINION AND GEAR ORIENT PROBLEM'S
	135		4 MIN. 38 sec.	39 sec.	LEANING PINION - MACHINE STOPPED AT PROBE STATION
	226		7 MIN. 45 sec.	58 sec.	ADJUST PINION FEED CHANNEL
	TOTAL PRODUCTION 2143		1 MIN. 53 sec.		MACHINE SHUT OFF 3:30 PM.

APPENDIX C

MACHINE DESCRIPTION No 6

#

No 1 GEAR AND PINION ASSEMBLY

PAGE 4 OF 7

DATE	QUANTITY COMPLETE	REJECT	OPERATING TIME	DOWN TIME	CAUSE OF DOWNTIME
9/80	37		55 sec	2 MIN 53 sec	PINION CHANNEL PROBLEM CHANNEL AND FEEDER BOWL RE-ALIGNED
30 .M	60		2 MIN 21 sec	11 sec	PINION LEANING MACHINE STOPPED BY PROBE
	9		38 sec	21 sec	BAD PINION IN CHANNEL
	36		1 MIN 34 sec	38 sec	BAD PINION IN CHANNEL
	268		9 MIN 21 sec	23 sec	SAFETY SWITCH FUNCTIONED PRE-MATURLY NO REASON FOUND
	100		3 MIN 21 sec	2 MIN 26 sec	NOT ENOUGH PINIONS FEEDING INTO CHANNEL - ALIGNMENT WITH FEEDER BOWL PROBLEM
	152		4 MIN 16 sec	1 MIN 3 sec	SHOT DOWN SO PINION CHANNEL COULD BE REFILLED
	75		4 MIN 4 sec	1 MIN 5 sec	SHOT DOWN SO PINION CHANNEL COULD BE REFILLED

APPENDIX C

Page 20C

MACHINE DESCRIPTION No 6#
No 1 GEAR AND PINION ASSEMBLY

PAGE 5 OF 7

DATE	QUANTITY COMPLETE	REJECT	OPERATING TIME	DOWN TIME	CAUSE OF DOWNTIME
1/9/80	72		2 MIN 24 sec	1 MIN 9 sec	SAFETY SWITCH OPERATED PREMATURELY NO REASON DETECTED.
	131		4 MIN 58 sec	1 MIN 48 sec	SHUT DOWN SO PINION CHANNEL COULD FILL UP.
	88		2 MIN 4 sec	1 MIN 24 sec	SHUT DOWN SO PINION CHANNEL COULD FILL UP.
	152		5 MIN 20 sec	1 MIN 25 sec	SHUT DOWN SO PINION CHANNEL COULD FILL UP.
	112		4 MIN 12 sec	54 sec	LEANING PINION - PROBE SHUT MACHINE OFF.
	52		1 MIN 22 sec	1 MIN 32 sec	MISSED WHEEL.
	188		6 MIN 38 sec	1 MIN 5 sec	SHUT DOWN SO PINION CHANNEL COULD FILL UP - NEED OPERATORS ATTENTION
	138		4 MIN 54 sec	10 MIN 33 sec	PINION LAYING IN CHANNEL - HAD TO BE REMOVED - FURNITABLE SHUT OFF WHILE HOPPER FEED PINIONS TO CHANNEL CHANNEL AND HOPPER TRACK RE-ALIGNED

Page 20D

APPENDIX C

MACHINE DESCRIPTION No 6 No 1 Gear AND PINION ASSEMBLY

PAGE 6 OF 7

DATE	QUANTITY COMPLETE	REJECT	OPERATING TIME	DOWN TIME	CAUSE OF DOWNTIME
7/9/80	44	1	1 MIN 43 sec.	1 MIN 57 sec.	LEANING PINION PROBE STOPPED MACHINE
	121	1	4 MIN 26 sec.	48 sec.	MISFED wheel
	114		3 MIN 59 sec	28 MIN 58 sec	PROBE SHUT MACHINE OFF SCREW DRIVER TYPE ORIENTATION PUNCH FROZE UP IN SPINDLE - NECESSITATING OVERHAUL OF PUNCH AND SPINDLE
	62		2 MIN. 40 sec	15 sec	PROBE STOPPED MACHINE BECAUSE OF LEANING PINION.
7/9/80	235		8 MIN		MACHINE SHUT OFF 10:15 AM BREAK TIME
7/9/80 10:15 A.M.	298		7 MIN 56 sec	30 sec.	NO-START 10:15 HOPPER TRACK AND PINION CHANNEL RE-ALIGNED - CHANNEL WAS NOT BRING FED ENOUGH PINIONS
	205		7 MIN 11 sec	35 sec	MACHINE SHUT OFF BY PROBE PINION WAS IN NEST - COULD SEE NO REASON WHY MACHINE SHUT OFF
	TOTAL PRODUCTION 4000		16 MIN 53 sec	1 MIN 36 sec	MISFED GEAR

MACHINE DESCRIPTION [#] No 6 [#] No 1 Gear AND PINION Assembly

PAGE 7 OF 7

DATE	QUANTITY COMPLETE	REJECT	OPERATING TIME	DOWN TIME	CAUSE OF DOWNTIME
11/20					
30 .M	10		8 sec	31 sec.	MISFED GEAR
	90		3 MIN. 22 sec	11 sec.	PINION NOT SEATED IN NEST PROPERLY PROBE SHUT OFF MACHINE
	45		1 MIN. 27 sec.	9 sec.	PART MISSING MISFED GEAR
	135		5 MIN. 50 sec.	10 sec.	PROBE SHUTOFF MACHINE PINION NOT SEATED IN NEST PROPERLY
	170		6 MIN. 22 sec.	8 sec.	STUCK AT STAKE STATION
	50		26 sec	17 sec	STUCK AT STAKE STATION
	45		33 sec.	25 MIN.	PARTS STICKING IN STAKE STATION PRESTAKER PUNCH REMOVED PUNCH JAMMED
	TOTAL COMPLETED 545				

APPENDIX C

Page 20F

II
MACHINE DESCRIPTION No 9 ROTOR REAM

PAGE 1 OF 4

TE	QUANTITY COMPLETE	REJECT	OPERATING TIME	DOWN TIME	CAUSE OF DOWNTIME
20			2 MIN.	1 MIN	SCRAP HOLDS BACK PART FROM ENTERING REAM STATION - OPERATOR MUST REMOVE SCRAP AND FEED PART INTO REAM STATION.
5					IT WAS NOTED THE COUNTER REGISTERS WITH EACH STROKE OFF THE REAM STATION WHETHER THERE IS A PART IN THE REAM STATION OR NOT. IT WAS DECIDED TO
5					WEIGH THE PARTS TO GET AN ACCURATE COUNT.
5					MACHINE RE-STARTED AND THE FOLLOWING INFORMATION COMPILED
20			3 MIN. 52 sec.	1 MIN. 40 sec	SCRAP BUILDUP IN SLIDE - NECESSARY TO REMOVE BY OPERATION AND FEED PART TO REAM STATION
5			1 MIN 18 sec.	32 sec	SCRAP IN CHANNEL - NECESSARY TO REMOVE SCRAP AND ADVANCE PARTS IN CHANNEL TO REAM STATION
5			1 MIN 57 sec	24 sec	STOP MACHINE TO BLOW OUT SCRAP IN CHANNEL
5			1 MIN 42 sec	21 sec	STOP MACHINE TO BLOW OUT SCRAP IN CHANNEL
20			2 MIN 29 sec	2 MIN 11 sec	SCRAP IN CHANNEL - HOPPER DOES NOT ENOUGH PARTS IN CHANNEL TO MAINTAIN A CONTINUOUS OPERATION.

MACHINE DESCRIPTION No 9 ROTOR REAM

PAGE 2 OF 4

DATE	QUANTITY COMPLETE	REJECT	OPERATING TIME	DOWN TIME	CAUSE OF DOWNTIME
			37 sec	34 sec	SCRAP IN CHANNEL
			1 MIN 57 sec	23 sec	SCRAP IN CHANNEL
			1 MIN 25 sec	4 MIN 4 sec	SCRAP IN CHANNEL. BAD PART IN CHANNEL HOPPER DOES NOT FEED ENOUGH PARTS TO CHANNEL. TRANSFER FROM HOPPER TO CHANNEL REJECTS MORE PARTS THAN IT ACCEPTS.
			1 MIN 12 sec	16 sec	SCRAP IN CHANNEL - OPERATOR HAS TO REMOVE AND RE-FILL CHANNEL
			25 sec	35 sec	CHANNEL SUPPLY OF PARTS - HOPPER TO CHANNEL TRANSFER DOES NOT KEEP CHANNEL FILLED UP. NEEDED TO BE RE-FILLED BY OPERATOR
			23 sec	18 sec	SCRAP IN CHANNEL
			1 MIN 37 sec	39 sec	SCRAP IN CHANNEL CHANNEL HAD TO BE FILLED BY OPERATOR
			1 MIN 35 sec	1 MIN 11 sec	SAME AS ABOVE

MACHINE DESCRIPTION No 9# ROTAR REAM

PAGE 3 OF 4

DATE	QUANTITY COMPLETE	REJECT	OPERATING TIME	DOWN TIME	CAUSE OF DOWNTIME
			3 MIN 40 sec	23 sec	SCRAP IN CHANNEL
			58 sec	30 sec	EMPTY CHANNEL - HOPPER TRANSFER TO CHANNEL ACCEPTS ONE PART AND REJECTS 17 - THUS THE CHANNEL CANNOT BE KEPT FILLED WITH PARTS
			2 MIN 20 sec.	21 sec.	SCRAP IN CHANNEL
			1 MIN 16 sec.	1 MIN 14 sec.	STOPPED TO FILL CHANNEL
			2 MIN	1 MIN 47 sec.	STOPPED TO FILL HOPPER ALSO TO FILL CHANNEL
			3 MIN 28 sec.	1 MIN 12 sec	SCRAP IN CHANNEL
			1 MIN 49 sec.	36 sec	SCRAP IN CHANNEL
			38 sec.	23 sec	SCRAP IN CHANNEL

APPENDIX D

Page 21B

MACHINE DESCRIPTION NO 9

ROTOR REAM

PAGE 4 OF 4

DATE	QUANTITY COMPLETE	REJECT	OPERATING TIME	DOWN TIME	CAUSE OF DOWNTIME
			21 sec.	18 sec.	SCRAP IN CHANNEL
			1 MIN 24 sec.	17 sec.	CHANNEL EMPTY CHANNEL HAD TO BE REFILLED BY OPERATOR
			18 sec.	12 sec.	SCRAP IN CHANNEL
			2 MIN 47 sec.	12 sec.	SCRAP IN CHANNEL CHANNEL EMPTY HAD TO BE REFILLED BY OPERATOR
			1 MIN 32 sec.	17 sec.	SAME AS ABOVE
			29 sec.	47 sec.	SCRAP IN CHANNEL OPERATOR STOPPED MACHINE TO FILL HOPPER
			24 sec.	26 sec.	SCRAP IN CHANNEL
	770		1 MIN 115 sec.		

APPENDIX D

Page 21C

